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Date of mailing (day/month/year) 13 June 2000 (13.06.00)	
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International filing date (day/month/year) 17 November 1999 (17.11.99)	**Priority date** (day/month/year) 27 November 1998 (27.11.98)
Applicant CLARK, Jonathan, Andrew	

1. The designated Office is hereby notified of its election made:

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08 May 2000 (08.05.00)

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09/830460

PATENT COOPERATION TREATY

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To:

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NOTIFICATION CONCERNING SUBMISSION OR TRANSMITTAL OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

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International publication date (day/month/year) 08 June 2000 (08.06.00)	Priority date (day/month/year) 27 November 1998 (27.11.98)
Applicant BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY et al	

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).

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Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
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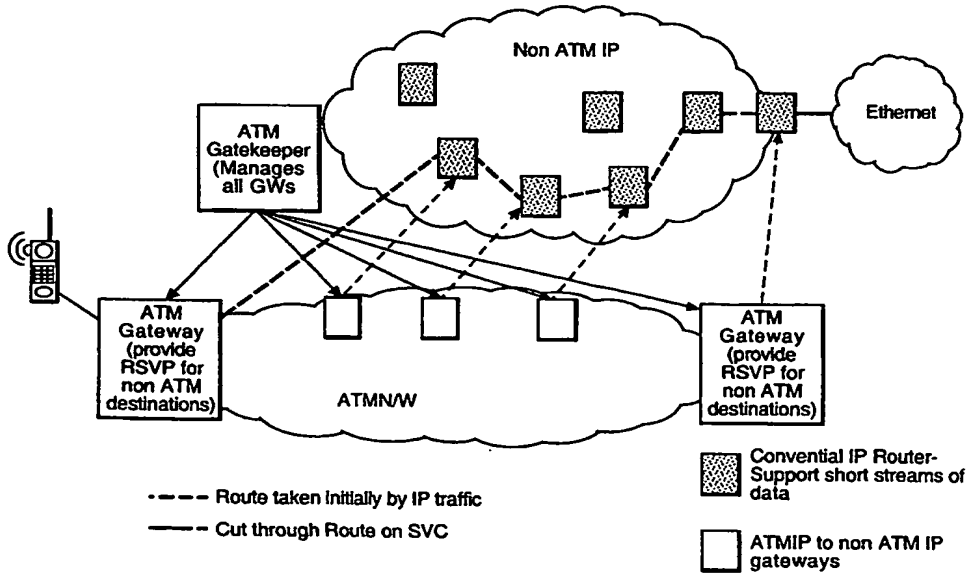

(57) Abstract

A communication system includes a packet–switched network and a circuit–switched network. Gateways on the circuit–switched network adapt packet traffic for transmission on the circuit–switched network. The end–point of the switched virtual circuit is chosen by transmitting polling messages from the gateways to the destination address of the packet and selecting a gateway depending on the delay in the response to the respective polling message.

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Communications Network

The present invention relates to a communications network and in particular to a network in which packets are routed on circuits established in a circuit-switched network.

Conventionally, networks using packet-based protocols such as internet protocol (IP) have functioned on a best-effort basis. As a result, quality of service, as measured by such parameters as packet loss and latency, has varied considerably depending on the loading of network resources such as routers. While such variation is acceptable for some applications, such as Email, it is potentially a barrier to the use of internet protocol for more critical applications such as voice telephony or multimedia conferencing. Accordingly, considerable effort has been addressed to developing guaranteed quality of service mechanisms for internet protocol traffic. One approach is to convert IP traffic for transmission via a circuit-switched network, such as an ATM (asynchronous transfer mode) network and to rely upon the QoS mechanisms inherent in such a network. One example of this approach is the architecture proposed by the ATM Forum and known as MPOA (multi-protocol over ATM). This is described in the specification published by the ATM Forum Technical Committee, "Multi-Protocol Over ATM Version 1.0" AF-MPOA-0087.000, July 1997. This type of approach suffers a number of disadvantages. In particular, it tends to achieve efficient routing only when the end-point of a particular connection lies on the circuit-switched network. Moreover this approach tends to function optimally only within the bounds of single network domain having a common control and management system.

According to a first aspect of the present invention, there is provided a method of operating a communications system comprising

a packet-switched network, a circuit-switched network, a plurality of gateways connecting the circuit-switched network to the packet-switched network, the method comprising;

a) receiving packet traffic at one of the gateways;

b) establishing in the circuit-switched network a circuit from the gateway to a node on the circuit-switched network; and

c) outputting the said packet traffic from the gateway onto the circuit; characterised by

d) outputting from a plurality of gateways polling messages addressed to the destination address of the packet traffic;

e) receiving at the gateways replies from the destination address;

f) determining the respective delays for the replies at the different respective gateways;

g)selecting one of the gateways depending on the respective delay times;

h) establishing the circuit to the node selected in step (g).

The invention provides a communications system which maximises the benefits to be obtained by the use of "cut-throughs" for packet traffic on a circuit-switched network, even when the ultimate destination of the packets does not itself lie on the circuit-switched network . This is achieved by sending polling messages, such as Ping messages as defined for packet networks using Internet Protocol, from gateways on the circuit-switched network into the packet-switched network. The optimum destination point on the circuit-switched network for the cut-through can then be selected dynamically to give the best path to the destination packet address.

Preferably the circuit-switched network includes a plurality of independently controlled networks and different ones of the plurality of gateway platforms are connected to different respective ones of the plurality of networks.

A further important advantage of the present invention is that it enables circuits to be established across different networks. By contrast, in an MPOA architecture, an SVC cut-through is limited to the extent of the MPOA network

Preferably the steps of selecting one of the gateways is carried out by a control node, and one or more of the gateways communicate a respective delay time to the control node. Preferably one or more of the gateways communicate a respective delay time to a control node and the step of selecting one of the gateways is carried out by the control node. The control node may be one of the gateways, or it may be a separate platform, remote from the gateways.

In a preferred implementation a control node, such as the gatekeeper described below, communicates with the gateways. By communicating a threshold delay to the nodes, and only returning delay values to the control node when the delay is less than the threshold, the processing and signalling overheads for determining the appropriate destination gateway are further minimised.

The invention also encompasses control nodes, gateways and networks incorporating such control nodes and gateways.

Systems embodying the present invention will now be described in futher detail, by way of example only, with reference to the accompanying drawings, in which;

Figure 1 is a schematic of a communications system embodying the invention;

Figure 2 is a diagram showing a gateway platform for use in the system of Figure 1;

Figure 3 is a diagram showing a gatekeeper platform for use in the system of Figure 1;

Figure 4 is a flow diagram showing the illustrating the operation of the network of Figure 1;

Figure 5 is a message flow diagram;

Figures 6a to 6e are schematic showing an alternative approach to determining the end point of a switched virtual circuit;

Figures 7a and 7b are schematics showing a prior art system;

Figure 8 illustrates a system embodying the present invention and spanning different ATM networks.

A communications system includes a gateway 1 which is connected via a network 2 to a number of customer terminals 3,4. In this example, the network 2 is an ethernet LAN, and the customer terminals generate traffic comprising Internet Protocol (IP) packets. The gateway 1 is connected to an ATM (asynchronous transfer mode) network which provides circuit-switched connections to an IP router 6, to one or more further gateways 7, and to ATM terminals 8. The IP router is connected in turn to the internet 9. The gateway 1 is also connected via the ATM network to a gatekeeper platfrom. The gatekeeper in combination with the gateway constitutes a control platform which controls the establishing of circuits through the ATM network that route traffic so as to provide required QoS levels, as will be further described below.

Figure 2 shows the gateway 1 in further detail. The gateway includes an Ethernet interface 21 which communicates IP packets with the network 2. It also includes a first group of ATM ports 22 which are connected to switched virtual circuits (SVC's) in the ATM network 5. A further ATM port 23 is connected to a

permanent virtual circuit (PVC) which connects the gateway via the ATM network 5 to the IP router 6, and via the IP router to an IP network. An ATM adaption layer (AAL5) associated with the ATM ports 22,23 converts IP data to the format required for transmission on the ATM network. The flow of traffic through the ports is controlled by a switching module 24. The switching module 24 is in turn controlled by inputs from QoS module 25 and from a gatekeeper interface 26. The QoS module may be programmed to respond to a number of standard IP-related QoS protocols including, in this example, RSVP (resource reservation protocol), SIP (session initiation protocol) and H323. In addition, the QoS module 25 may include a proprietary interface to allow direct requests for QoS levels to be transmitted from, e.g, one of the terminals on the network 2.

Figure 3 shows the structure of the gatekeeper. Although it may alternatively be integrated with one of the gateways, in this preferred implementation the gatekeeper is a separate platform at a location remote from the gatekeepers. It includes an interface 31 for communication with each of the gateways, and a UNI/SAAL (User-to-Network Interface/ Signalling ATM Adaption Layer) interface 32 to the ATM network. This interface 32 to the ATM network is used to output control signals to ATM routers and other entities in the network in order, for example to set up a switched virtual circuit SVC. A gatekeeper control module 33 responds to signalling on the interfaces 31,32. The control module 33 is linked to an egress point selection module. As will be described in further detail below, the egress point selection module cooperates with the gateways to find and select an appropriate end-point for the switched virtual circuit.

The operation of the system of Figure 1 is now described with reference to the flow diagram of Figure 4. Initially, one of the terminals connected to the LAN outputs a stream of IP packets carrying a particular IP Address and also carrying an associated IP QoS level. These are received at the gateway (4.1). These initial packets are passed from the gateway on via the PVC to the internet router, and are routed (4.2) on the internet to the destination address in a conventional fashion. Concurrently, the gateway transmits a request to the gatekeeper (4.3). A configurable algorithm in the gatekeeper ensures that this request is only generated after a predetermined minimum number of packets to the same destination have been received. In this example the required minimum number is three packets in a ten second period. This threshold prevents

overloading of the gatekeeper by transient requests. The request sent to the gatekeeper includes the IP address and quality level Q of the stream of packets. The gatekeeper then selects an appropriate egress node on the ATM network (4.4). The process of selection is described in detail below with reference to Figure 6 This returns (4.5) an ATM address which may be that of the destination itself, if that destination is on the ATM network or, as in this example, is that of a gateway connected to a network on which the destination is located. If there is no ATM address for this IP destination address it will mark this address accordingly in the short term address cache at both the gateway or gatekeeper to avoid another lookup to this IP address. The gatekeeper then determines (4.6) whether a SVC to the ATM address is capable of providing the requested QoS. If not, then the gatekeeper function is terminated, and the IP packets will continue to be passed via the IP router onto the internet. If the required QoS is available on a SVC, then the gatekeeper forwards the RSVP request to an egress gateway (4.7). This is then forwarded to the or each other router between the gateway and the destination address. The response to the RSVP request, which in this example is positive, is then returned via the egress gateway to the gatekeeper (4.8). The gatekeeper returns this positive RSVP response (4.9) via the gateway to the originating terminal. The gateway may then request the gatekeeper to set up the SVC. Alternatively, the gateway may inform the gatekeeper of the required flow rate and a decision whether or not to set up an SVC is then left to the gatekeeper. The gatekeeper then uses proxy signalling into the ATM network to set up the SVC to the destination ATM addresses, and identifies the SVC to the gateway (4.10). Once the SVC identification is received by the gateway, it routes subsequent packets in the datastream out via one of the ATM ports onto the SVC.

Release of the SVC may be initiated by the ingress gateway when the flow of packets from the terminal having the specified destination address stops, or alternatively when an explicit signal is received from the terminal indicating that the transmission to that address had ended. In addition, the gatekeeper is able to release the SVC, for example in order to free capacity for another higher priority data stream, by direct signalling into the network.

Figure 5 shows the message flows used to implement the process described above.

Figures 6a to 6e show the preferred scheme for identifying the optimum egress gateway for the switched virtual circuit. As shown in Figure 6a, packets are initially routed from a gateway into a non-ATM IP network. Subsequently the gateway may detect a sustained flow of traffic to a particular IP address, and/or may receive a request for a certain QoS level for a data flow to that IP address. In response to these conditions, the gateway notifies the gatekeeper. The gatekeeper instructs (Figure 6b) all of its gateways to transmit a Ping message to the destination IP address. This instruction is accompanied by a threshold time for the response to the Ping message. The gateways receiving this instruction from the gatekeeper may be located on different ATM networks. In response, each gateway transmits a Ping message into the IP network (Figure 6c). The different gateways receive replies (Figure 6d) to the Ping message with delays which vary according to factors such as the number of router hops between the gateway and the destination, and the loading of the IP network between the gateway and the destination. In this example, two of the gateways have response times for the replies which fall below the threshold specified by the gatekeeper. These two gateways, referenced GW4, GW5 in the Figure, return a signal to the gatekeeper indicating the delay in their respective responses to the Ping message. The gatekeeper selects the gateway with the lowest delay, GW5 in this example, and sets up a switched virtual circuit from the initial gateway, GW4, to GW5. In this way a significant increase in the level and reliability of the QoS for the data stream is realised, despite the fact that the destination is an IP address that, in this example, is not directly connected to any ATM network.

Figures 7a and 7b illustrate a prior art system using the MPOA (multi protocol over ATM) architecture. This system includes an MPOA server that corresponds in some, but not all, respects to the gatekeeper of the present and a number of MPOA clients that similarly correspond in some respects to the gatekeepers of the present invention. The system uses a number of ATM switches which implement the ATM forum LANE (local area network emulation) protocol. The ATM server contains a routing function which controls the ATM switches both to route individual packets and also to establish, where appropriate, switched virtual circuits between selected MPOA clients. The extent of any virtual circuit is limted to an individual MPOA network. As shown in Figure 7b, at the boundary between different MPOA networks, or when a conventional non-MPOA

ATM network is reached, there is a delay associated with a return to the IP routing layer.

Figure 8 illustrates an embodiment of the invention in which an SVC is established that spans a number of different ATM networks. The only requiremens for this to be possible are that there should be gateways on the ingress and egress networks, and that standard ATM circuit set-up protocols should be supported across the boundaries of the different networks.

Although the examples described above relate to IP traffic and ATM networks, the invention is applicable to other types of networks including, for example X.25 networks or frame relay networks.

CLAIMS

1. A method of operating a communications system comprising

a packet-switched network, a circuit-switched network, a plurality of gateways connecting the circuit-switched network to the packet-switched network, the method comprising;

a) receiving packet traffic at one of the gateways;

b) establishing in the circuit-switched network a circuit from the gateway to a node on the circuit-switched network; and

c) outputting the said packet traffic from the gateway onto the circuit; characterised by

d) outputting from a plurality of gateways polling messages addressed to the destination address of the packet traffic;

e) receiving at the gateways replies from the destination address;

f) determining the respective delays for the replies at the different respective gateways;

g)selecting one of the gateways depending on the respective delay times;

h) establishing the virtual circuit to the gateway selected in step (g).

2. A method according to claim 1, in which the circuit-switched network includes a plurality of independently controlled networks and different ones of the plurality of gateways are connected to different respective ones of the plurality of networks.

3. A method according to claim 1 or 2, in which one or more of the gateways communicate a respective delay time to a control node and the step of selecting one of the gateways is carried out by the control node.

4. A method according to claim 3, in which only the or each gateway having a respective delay value less than a threshold value communicates the delay value to the control node.

5. A method according to any one of the preceding claims in which the packets are Internet Protocol (IP) packets.

6. A method according to any one of the preceding claims in which the circuit-switched network is an ATM (asynchronous transfer mode) network.

7. A control node for use in a method according to any one of the preceding claims, the control node including a control processor and a signalling interface, which signalling inteface, in use, communicates signals with a plurality of gateways in a circuit-switched network, the control processor being arranged to carry out the following steps in sequence:

a) communicating instructions to the plurality of gateways to transmit polling messages to a destination address in a circuit-switched network connected to the gateways;

b) receiving from the plurality of gateways indications of respective delays in responses to the polling messages:

c) selecting, depending on the respective delays, one of the gateways as the end-point of a virtual circuit.

8. A gateway for use in a method according to any one of the preceding claims, the gateway including a first interface for connection to a packet-switched network, a second interface for connection to a circuit-switched network, and a control processor including a control interface arranged to communicate control signals with a control node, the control processor being arranged to carry out the following steps in sequence:

a) in response to a control message from the control mode transmitting a polling message to a destination address in the circuit-switched network;

b) receiving a reply from the destination address and determining the delay of the reply;

c) communicating the reply to the control node.

9. A communications network including a control node according to claim 7 and a gateway according to claim 8.

Fig.1.

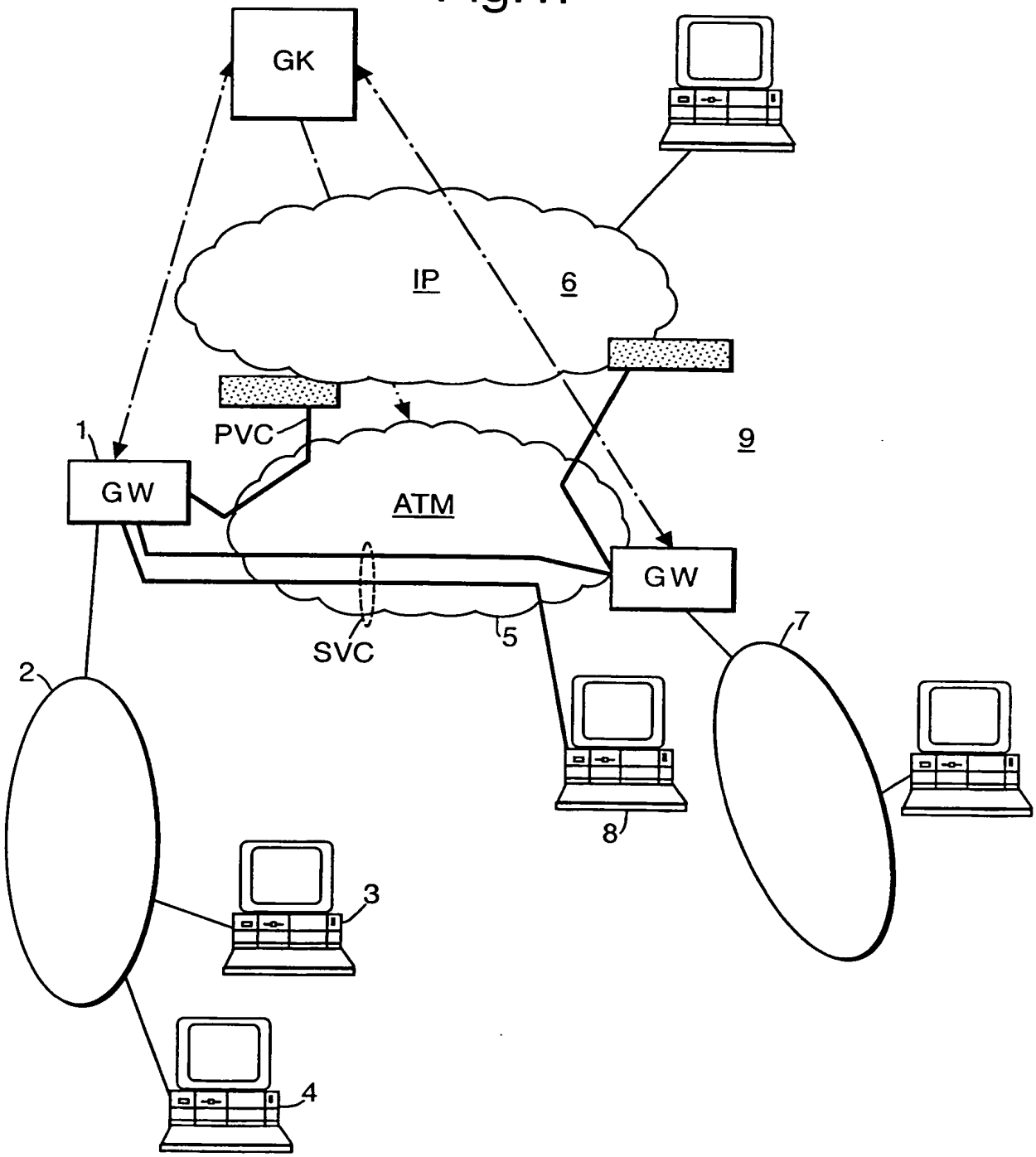


Fig.2.

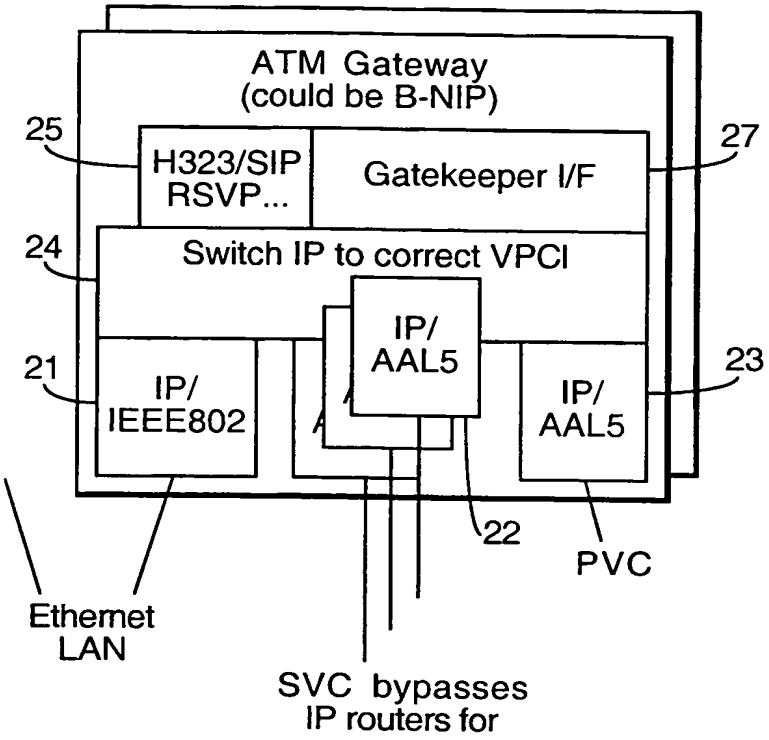

ATM Gateway
(could be B-NIP)
25
H323/SIP
RSVP...
Gatekeeper I/F
27
24
Switch IP to correct VPCI
IP/
AAL5
21
IP/
IEEE802
IP/
AAL5
23
22
PVC
Ethernet
LAN
SVC bypasses
IP routers for

Fig.3.

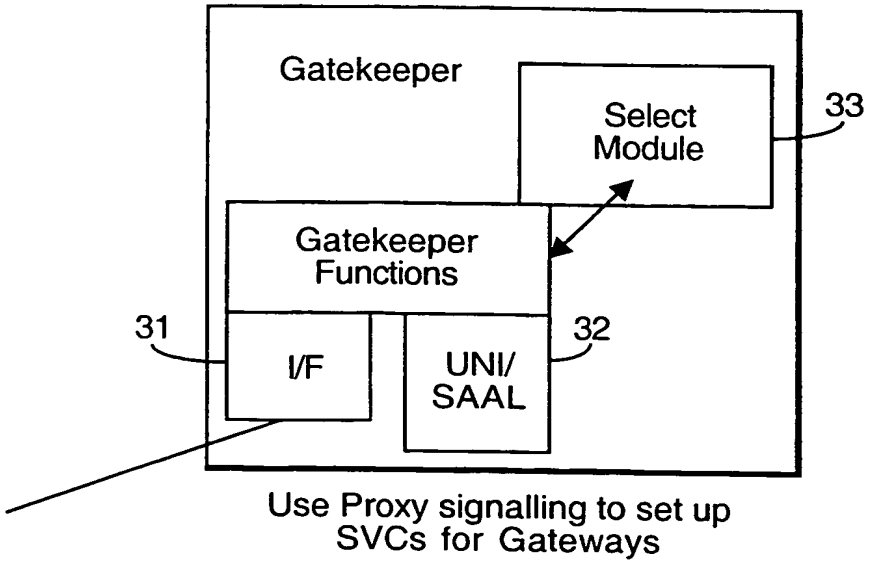
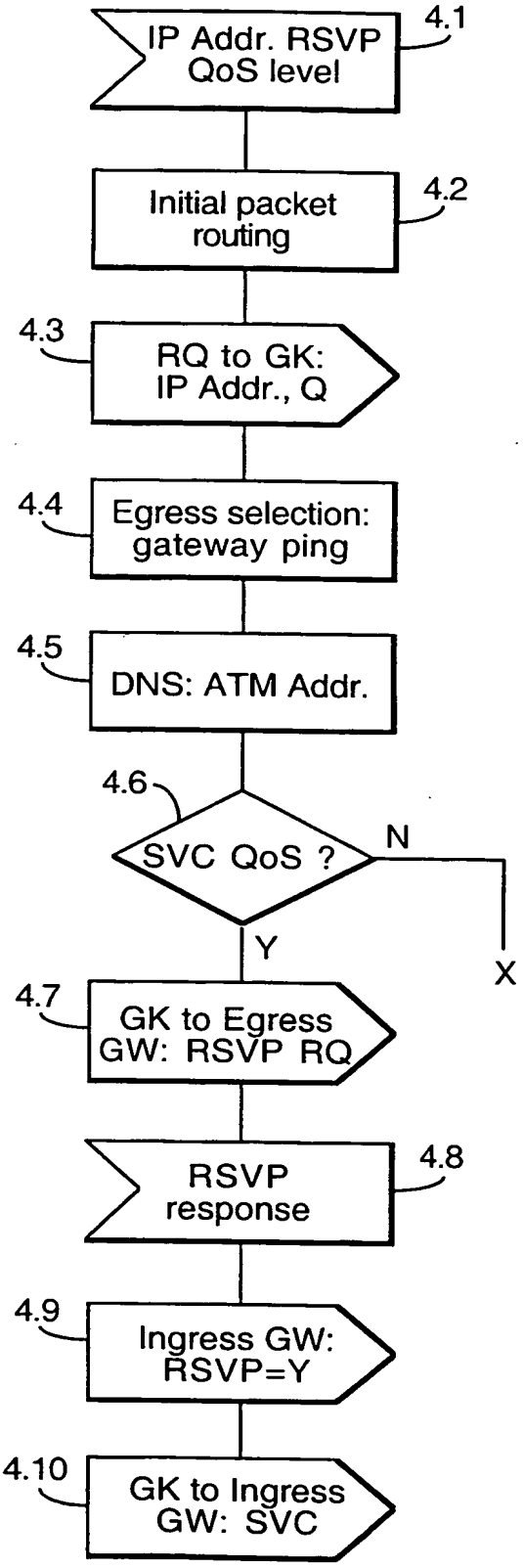

Gatekeeper
Select
Module
33
Gatekeeper
Functions
31
I/F
UNI/
SAAL
32
Use Proxy signalling to set up
SVCs for Gateways

Fig.4.


IP Addr. RSVP QoS level
4.1
Initial packet routing
4.2
4.3
RQ to GK: IP Addr., Q
4.4
Egress selection: gateway ping
4.5
DNS: ATM Addr.
4.6
SVC QoS ?
N
Y
X
4.7
GK to Egress GW: RSVP RQ
RSVP response
4.8
4.9
Ingress GW: RSVP=Y
4.10
GK to Ingress GW: SVC

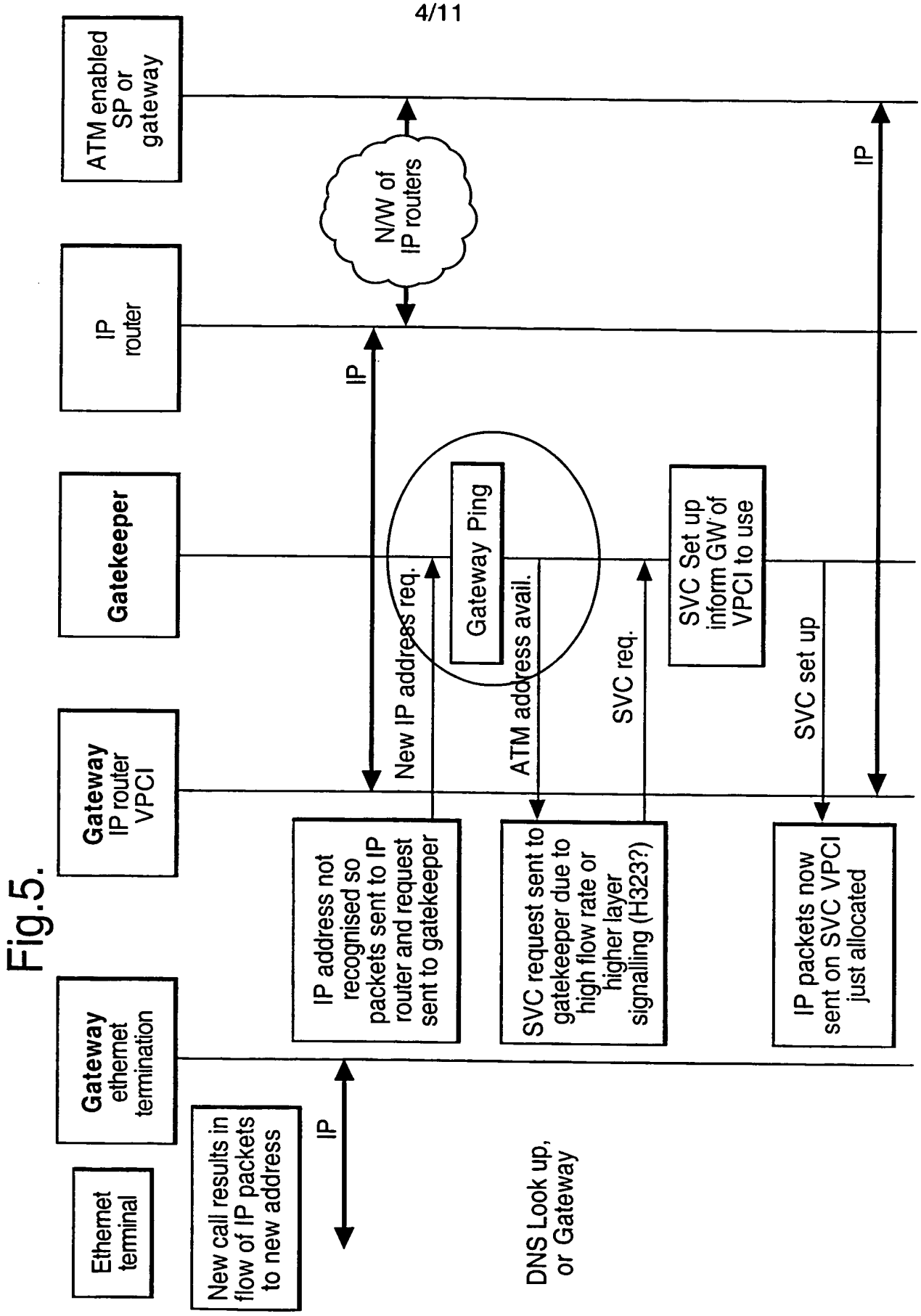

ATM enabled SP or gateway
N/W of IP routers
IP router
IP
IP
Gatekeeper
Gateway Ping
SVC Set up inform GW of VPCI to use
Gateway IP router VPCI
New IP address req.
ATM address avail.
SVC req.
SVC set up
IP address not recognised so packets sent to IP router and request sent to gatekeeper
SVC request sent to gatekeeper due to high flow rate or higher layer signalling (H323?)
IP packets now sent on SVC VPCI just allocated
Gateway ethernet termination
Ethernet terminal
New call results in flow of IP packets to new address
IP
DNS Look up, or Gateway

Fig.5.

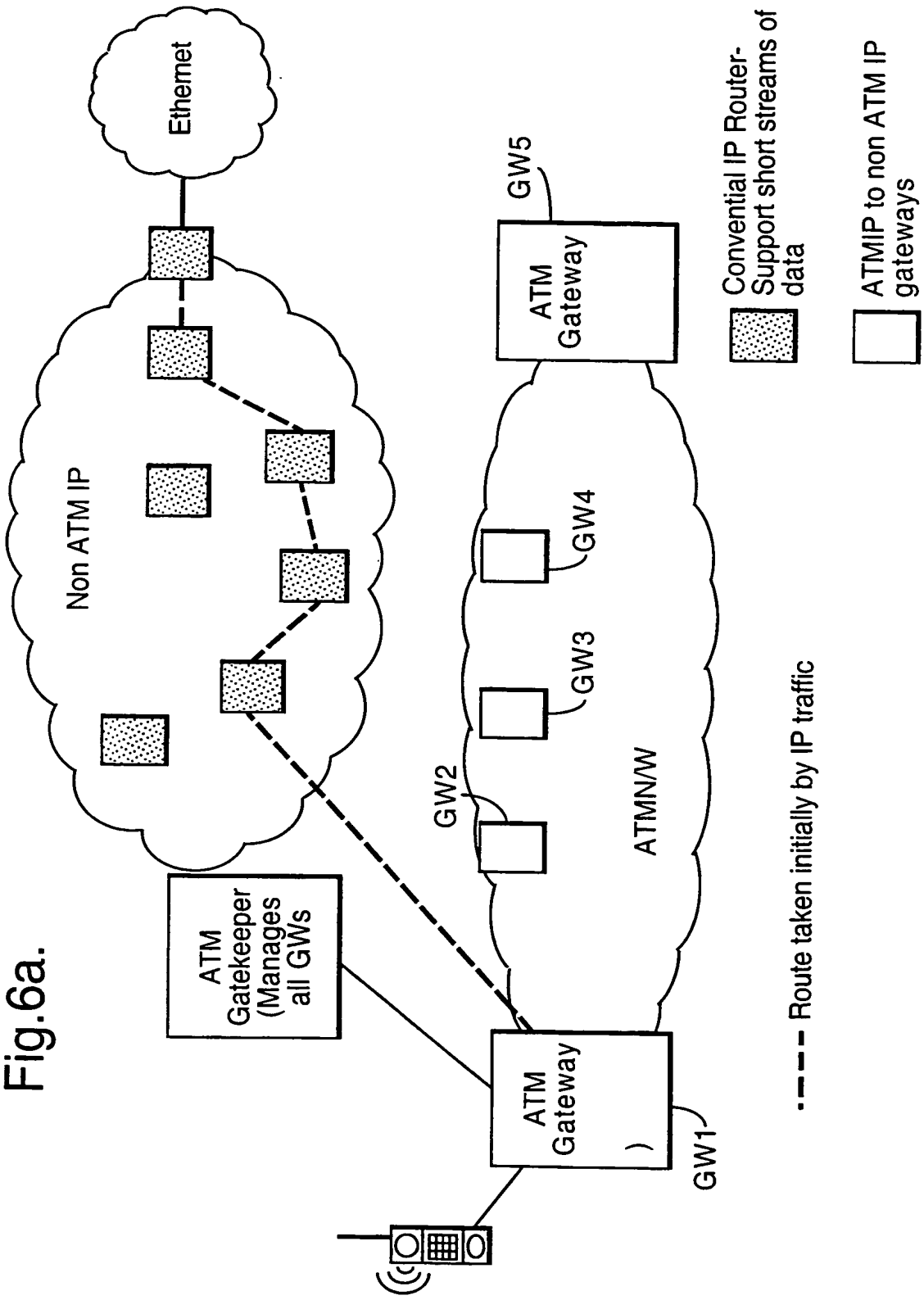

Ethernet
Non ATM IP
ATM Gatekeeper (Manages all GWs
ATM Gateway
GW1
GW2
GW3
GW4
ATMN/W
ATM Gateway
GW5
Convential IP Router- Support short streams of data
ATMIP to non ATM IP gateways
Route taken initially by IP traffic

Fig.6a.

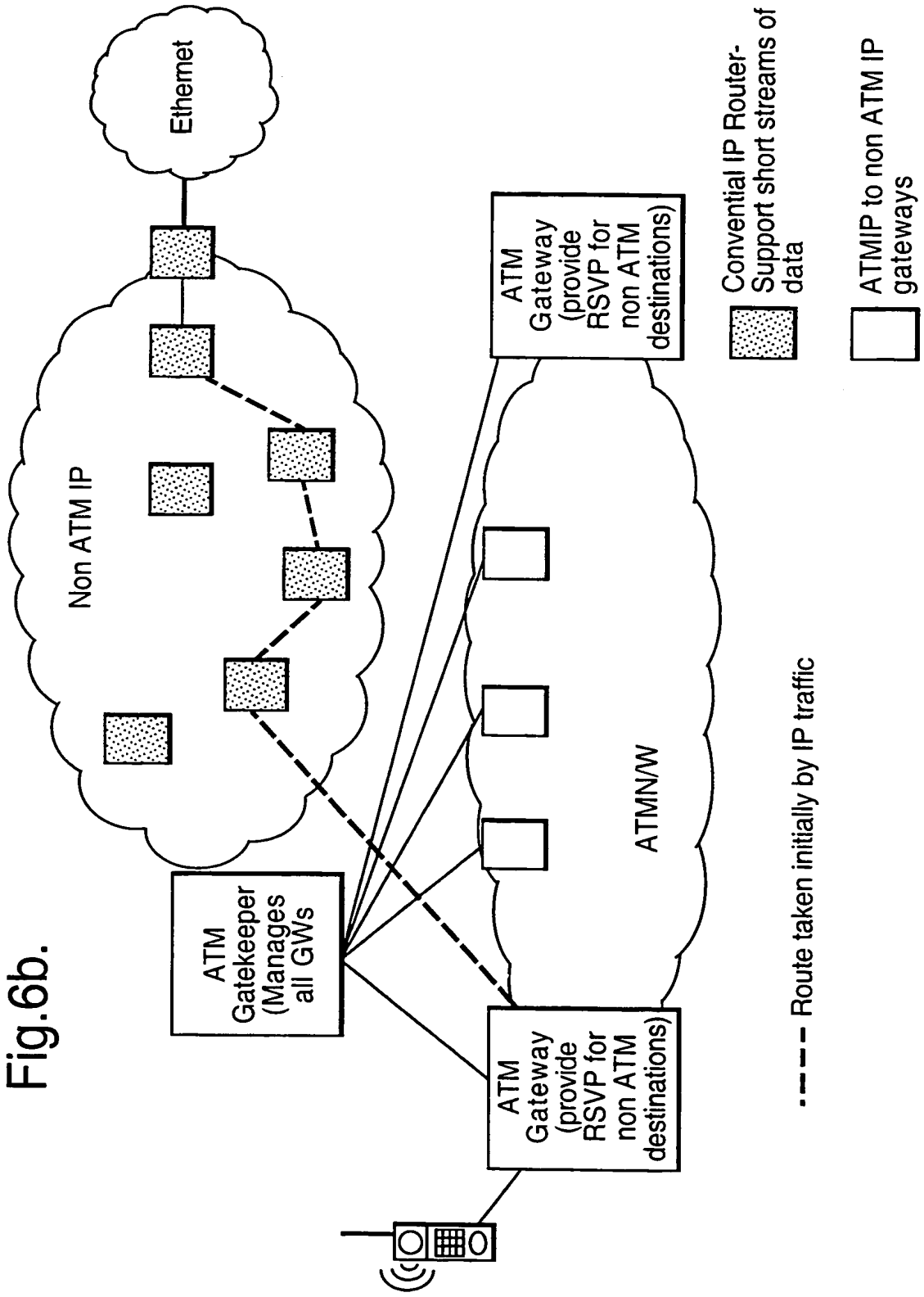

Ethernet
Non ATM IP
ATM Gatekeeper (Manages all GWs
ATM Gateway (provide RSVP for non ATM destinations)
ATM Gateway (provide RSVP for non ATM destinations)
ATMN/W
Conventional IP Router- Support short streams of data
ATMIP to non ATM IP gateways
Route taken initially by IP traffic

Fig.6b.

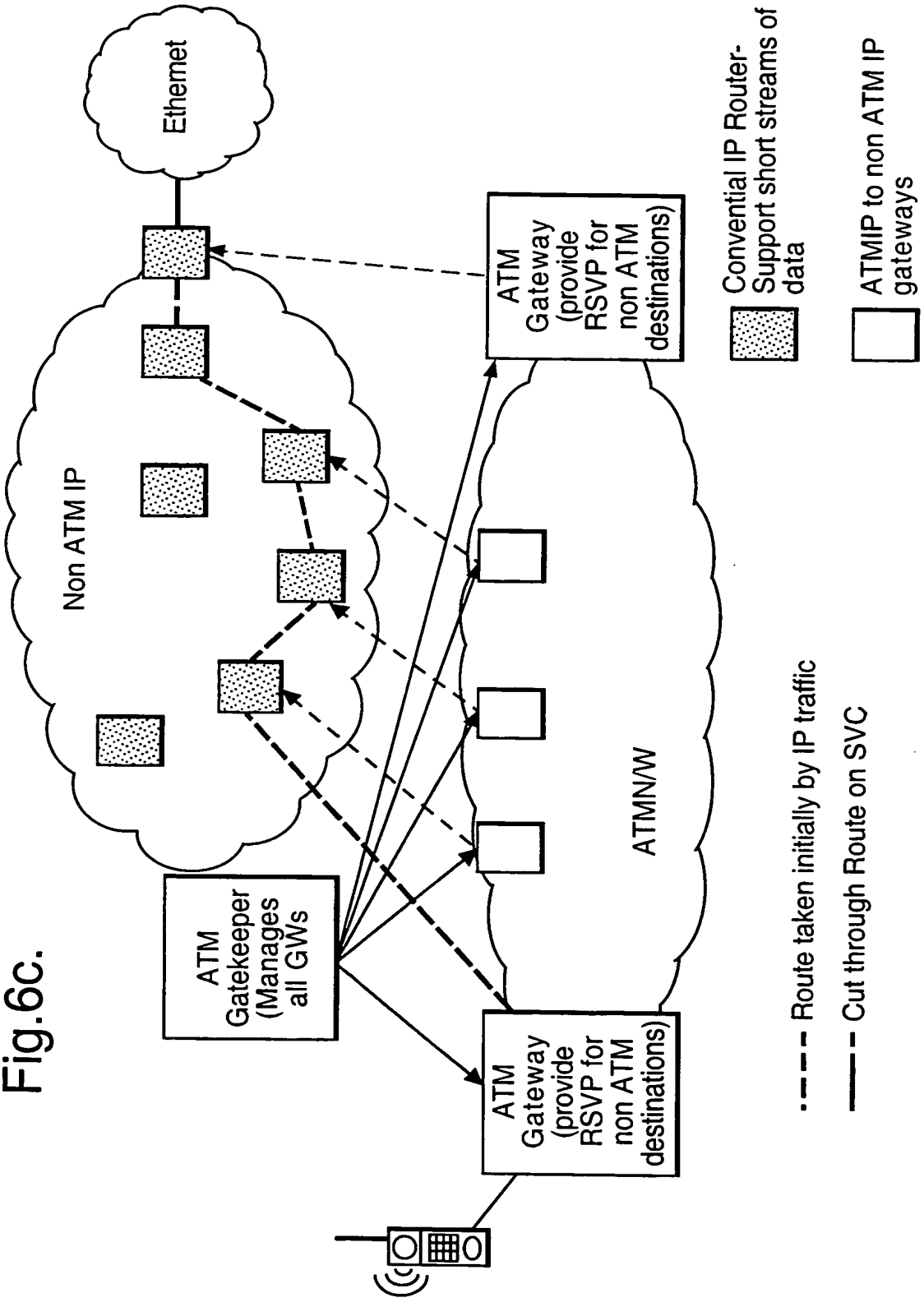

Ethernet
Non ATM IP
ATM Gateway (provide RSVP for non ATM destinations)
Convential IP Router- Support short streams of data
ATMIP to non ATM IP gateways
ATM Gatekeeper (Manages all GWs
ATMN/W
ATM Gateway (provide RSVP for non ATM destinations)
Route taken initially by IP traffic
Cut through Route on SVC

Fig.6c.

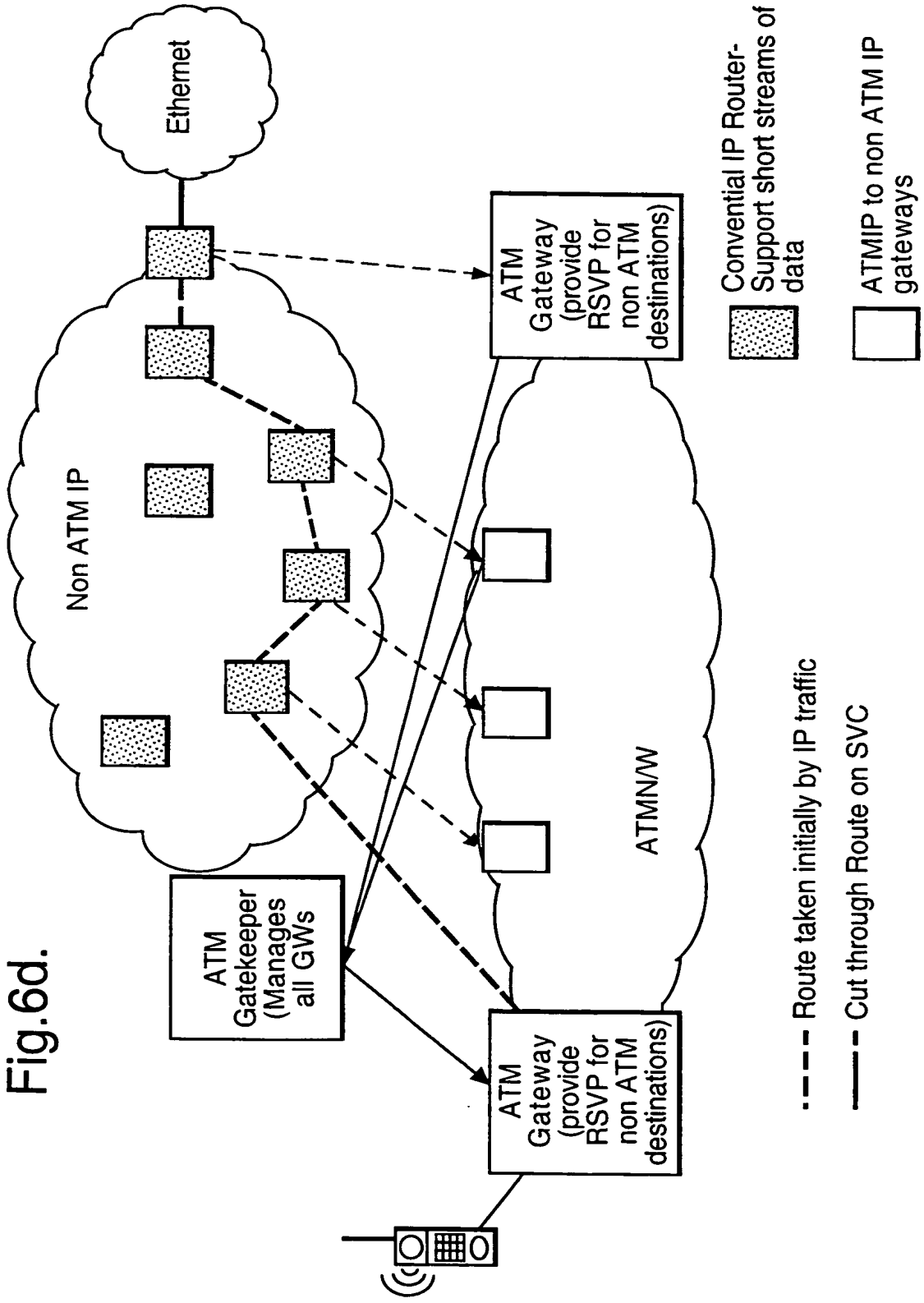

Ethernet
Non ATM IP
ATM Gatekeeper (Manages all GWs
ATM Gateway (provide RSVP for non ATM destinations)
ATM Gateway (provide RSVP for non ATM destinations)
ATMN/W
Convential IP Router- Support short streams of data
ATMIP to non ATM IP gateways
Route taken initially by IP traffic
Cut through Route on SVC

Fig.6d.

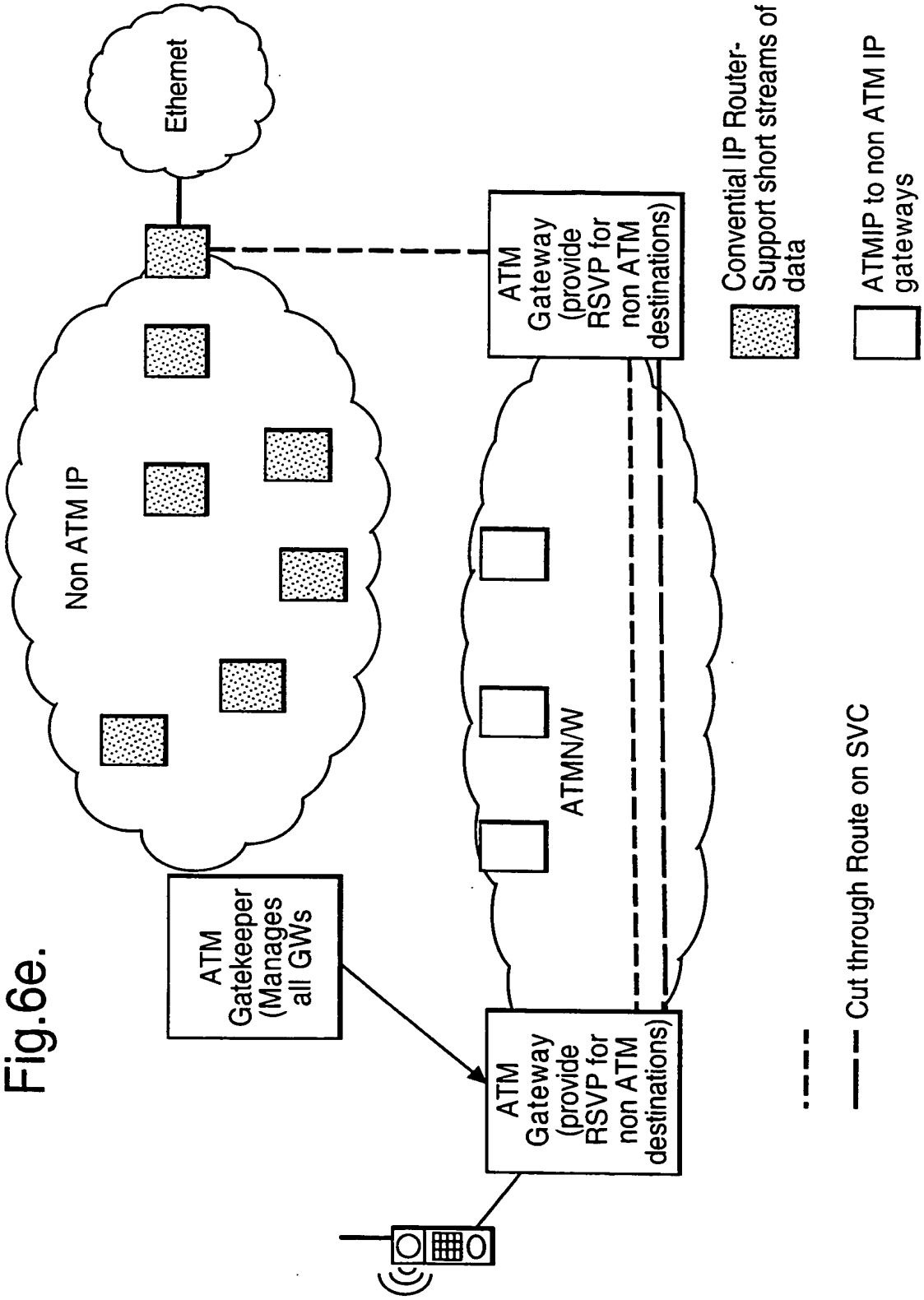

Ethernet
Non ATM IP
ATM Gateway (provide RSVP for non ATM destinations)
ATMN/W
ATM Gatekeeper (Manages all GWs
ATM Gateway (provide RSVP for non ATM destinations)
Convential IP Router- Support short streams of data
ATMIP to non ATM IP gateways
Cut through Route on SVC

Fig.6e.

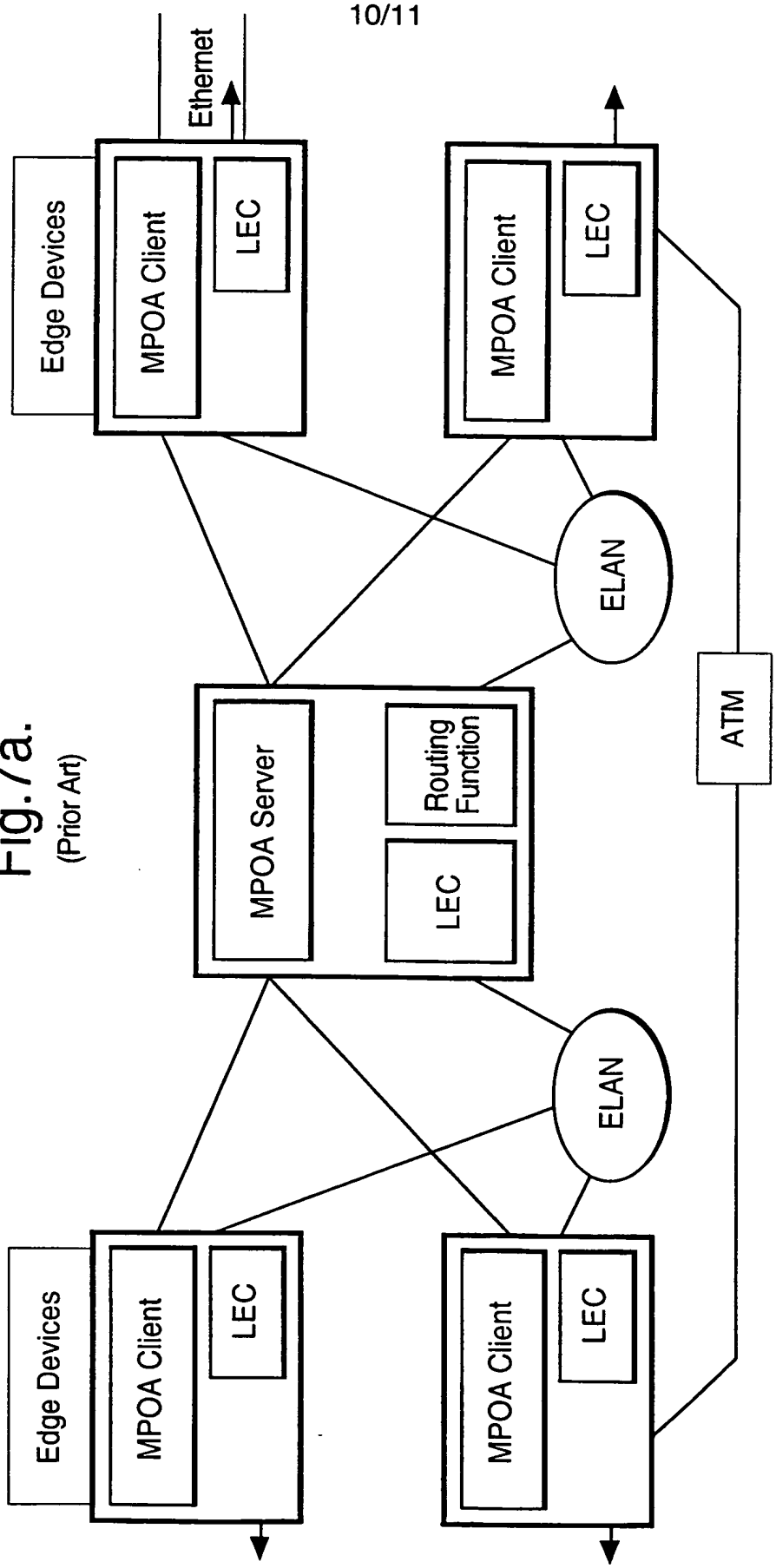


Fig.7a.
(Prior Art)

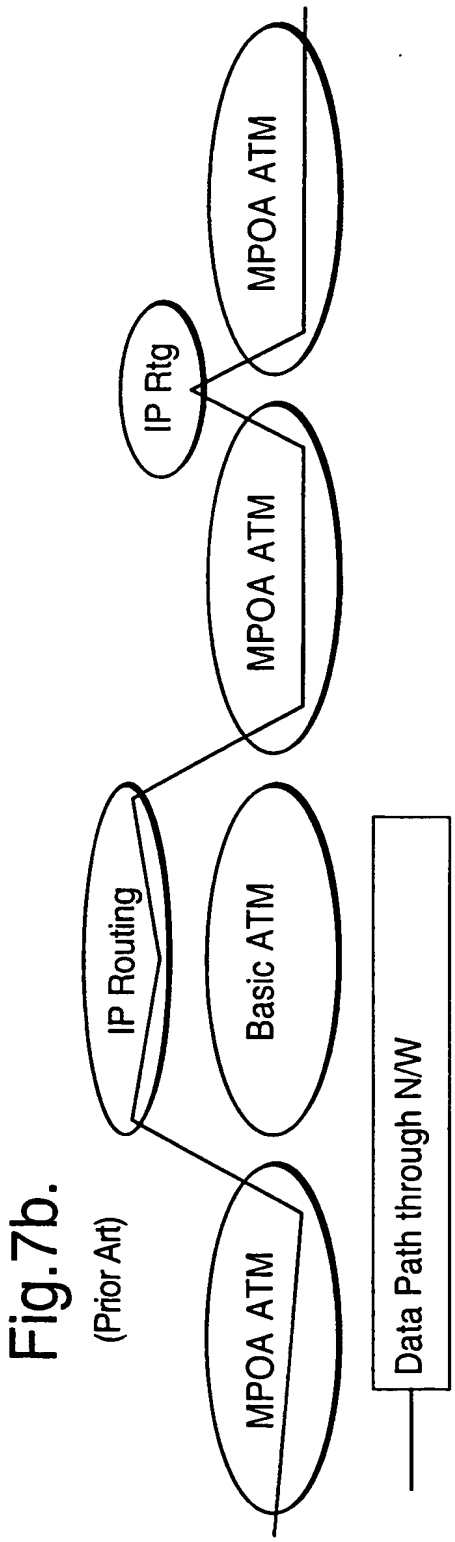


Fig.7b.
(Prior Art)

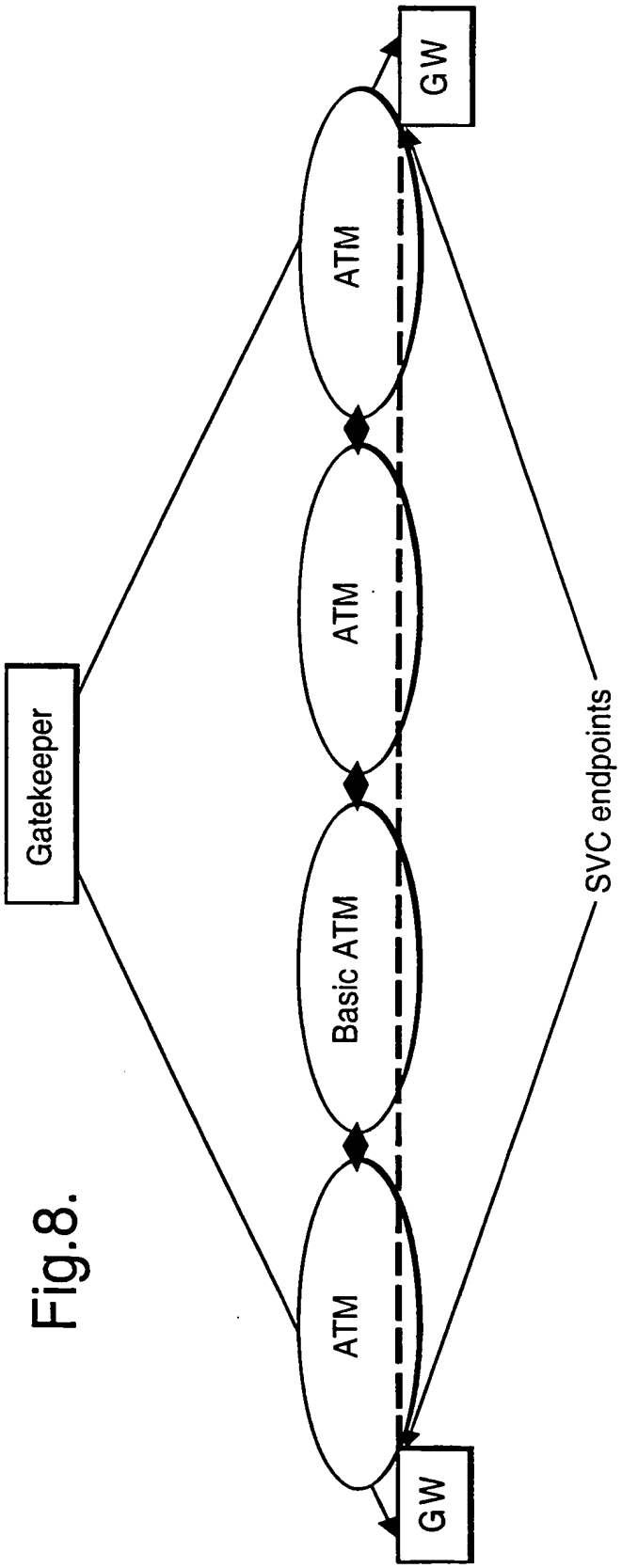


Fig.8.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
A25718 WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB99/03826	17/11/1999	27/11/1998
International Patent Classification (IPC) or national classification and IPC H04Q11/04		
Applicant BRITISH TELECOMMUNICATIONS PUBLIC LIMITED...et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08/05/2000	02.03.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Nentwich, H Telephone No. +49 89 2399 8992

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/03826

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:
Description, pages:

1-7 as originally filed

Claims, No.:

1-9 as originally filed

Drawings, sheets:

1/11-11/11 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-9
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations
   see separate sheet

Concerning Section V:

1 Prior art

The invention relates to a method (**Claim 1**) of operating a communications system which comprises a packet-switched network, a circuit-switched network, a plurality of gateways connecting the circuit-switched network to the packet-switched network, the method comprising
a) receiving packet traffic at one of the gateways;
b) establishing in the circuit-switched network a circuit from the gateway to a node on the circuit-switched network; and
c) outputting the said packet traffic from the gateway onto the circuit.

As indicated by the Applicant in the opening part of the description, this concept is described in the specification published by the ATM Forum Technical Committee, "Multi-Protocol Over ATM Version 1.0" AF-MPOA-0087.000, July 1997. This type of approach suffers a number of disadvantages. In particular, it tends to achieve efficient routing only when the end-point of a particular connection lies on the circuit-switched network. Moreover, this approach tends to function optimally only within the bounds of single network domain having a common control and management system.

2 Object

It is thus the object of the present invention to overcome the above-mentioned disadvantages.

3 Solution

This object is achieved by the following further steps of
d) outputting from a plurality of gateways polling messages addressed to the

destination address of the packet traffic;
e) receiving at the gateways replies from the destination address;
f) determining the respective delays for the replies at the different respective gateways;
g)selecting one of the gateways depending on the respective delay times;
h) establishing the circuit to the node selected in step (g), as indicated in the characterizing part of **Claim 1**.

The above-mentioned object is further achieved by a control node (independent **Claim 7**) for use in a method according to Claim 1, a gateway (independent **Claim 8**) for use in a method according to Claim 1, and a communications network (independent **Claim 9**). including a control node according to Claim 7 and a gateway according to Claim 8.

The invention provides a communications system which maximises the benefits to be obtained by the use of "cut-throughs" for packet traffic on a circuit-switched network, even when the ultimate destination of the packets does not itself lie on the circuit-switched network . This is achieved by sending polling messages from gateways on the circuit-switched network into the packet-switched network. The optimum destination point on the circuit-switched network for the cut-through can then be selected dynamically to give the best path to the destination packet address.

4 Conclusion of the Preliminary Examination Report

The above-mentioned specific solution is not disclosed in or rendered obvious by the three documents (category A) cited in the International Search Report. The subject-matter of **Claims 1 and 7 to 9** is therefore novel and inventive, and obviously also industrially applicable (Articles 33(1) to 33(4) PCT). **Claims 2 to 6** are dependent upon Claim 1 and their subject-matter is therefore equally novel, inventive and industrially applicable.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
A25718 WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/GB 99/03826	17/11/1999	27/11/1998
Applicant		
BRITISH TELECOMMUNICATIONS PUBLIC LIMITED...et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 6C

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL REPORT

International Application No
P[redacted]B 99/03826

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q11/04 H04L12/66

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 732 078 A (ARANGO MAURICIO) 24 March 1998 (1998-03-24) figure 6 column 9, line 27 -column 10, line 10 column 10, line 58 -column 13, line 24	1,5-8
A	US 5 727 002 A (CATES KENNETH ET AL) 10 March 1998 (1998-03-10) column 16, line 17 - line 26	1,7,8

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2000	24/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Scalia, A

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SCHRODI K J ET AL: "INTEGRATION OF IP PACKET FORWARDING IN AN ATM SWITCH" ISS '97. WORLD TELECOMMUNICATIONS CONGRESS. (INTERNATIONAL SWITCHIN SYMPOSIUM), GLOBAL NETWORK EVOLUTION: CONVERGENCE OR COLLISION? TORONTO, SEPT. 21 - 26, 1997, vol. 1, 21 September 1997 (1997-09-21), pages 247-254, XP000720530 ABE S ET AL figures 3,4 paragraph '03.2! paragraph '03.3!	1,2

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 99/03826

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5732078 A	24-03-1998	CA 2241451 A	24-07-1997
		EP 0872059 A	21-10-1998
		JP 11502997 T	09-03-1999
		WO 9726725 A	24-07-1997
US 5727002 A	10-03-1998	US 5553083 A	03-09-1996
		US 5920701 A	06-07-1999
		AU 5295096 A	07-08-1996
		EP 0804838 A	05-11-1997
		JP 10512726 T	02-12-1998
		WO 9622641 A	25-07-1996